# Q-255

## SVE BULLETIN

***SPECIAL VEHICLE ENGINEERING – BODY BUILDERS ADVISORY SERVICE***

E-Mail via Website: www.fleet.ford.com/truckbbas (click "Contact Us")

Toll-free: (877) 840-4338

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# 2017 F-Series Super Duty with Aftermarket Auxiliary AC System Control

## Models Affected

2017 F-350, F-450, F-550 Chassis Cab applications with the addition of auxiliary air conditioning systems beginning 2017MY.

## Purpose

The addition of aftermarket auxiliary air conditioning will require control of the AC clutch via vehicle CAN bus. This bulletin provides direction to Final Stage Manufacturers that add auxiliary air conditioning systems.

## CLIMATE CONTROL SYSTEM

It is recommended that when installing an auxiliary AC/Heater system package the Final Stage Manufacturer meet or exceed the current standard of the current production vehicle line in occupant comfort performance both in heating and air conditioning. The following items are important for maximum efficiency and performance of the system. See Figure 1

FORD DEFROSTING and DEFOGGING SYSTEM PERFORMANCE

1. The performance of the Ford defrost and defog system must not be diminished by the addition of auxiliary heater or air conditioning systems. Final Stage Manufacturers are reminded of their responsibility to maintain compliance to **FMVSS 103 and CMVSS 103, Windshield Defrosting and Defogging Systems**. **DO NOT** install any type of coolant shutoff valve or coolant diverter in the heater hoses leading to the OEM heater and defroster system. The climate control system is designed to cycle during the defrost modes to supply dry air to the defroster nozzle to increase defroster efficiency.

**AIR CONDITIONING**

1. R134a charged AC systems must use PAG type lubricating oil YN-12-D, Ford part number WSH-M1C231-B. Always use the same refrigerant and oil as equipped with the production vehicle.

Reference current production R134a & PAG oil charge levels:

| Vehicle | R134a (oz) | PAG oil (oz) |
|---|---|---|
| F350/450/550 (GAS) | 27 ± 1.0 | 4.1 |
| F350/450/550 (DIESEL) | 27 ± 1.0 | 3.4 |

2. **Ford Motor Company front system specs:**
   - TXV size: 2.0 TON
   - AC Compressor Displacement: 200cc fixed
   - AC Condenser heat rejection (Gas): 11.3KW (avg)
   - AC Condenser heat rejection (Diesel): 11.3KW (avg)

3. **Auxiliary AC units must:**
   - **Do not** use CCOT / orifice tube systems in combination with the front Ford Motor Company TXV system
   - A TXV with a refrigerant bleed is required. This will allow oil and refrigerant to return back to the AC Compressor
   - It is the responsibility of the Final Stage Manufacturer when combining an auxiliary AC system with the Ford Motor Company AC system to perform a **REFRIGERANT CHARGE LEVEL DETERMINATION TEST** and **OIL IN CIRULATION** and **EVAPORTATOR CORE ICING**.
   - It is the responsibility of the Final Stage Manufacturer to maintain a 4% suspended oil ratio in the AC system for proper compressor lubrication
   - A label stating the total refrigerant charge, type of refrigerant (R134a), and type of compressor lubricating oil (PAG), must be affixed in a conspicuous place in the engine compartment
   - Compressor discharge gas temperature should not exceed 130°C skin temperature when measured under any conditions. Skin temperature should be measured on the AC discharge line immediately out of the compressor below the muffler

4. At no time should the fan shroud or stator be modified or trimmed
5. Do not modify any of the front end seals to the cooling module. These prevent hot air recirculation from coming back into the AC Condenser
6. Establish a quality control method to inspect and resolve leaks, kinks, inadequate clearance issues, and total system operations
7. **DO NOT** splice into the compressor clutch wire. Must use an aftermarket CAN vehicle control module to communicate with vehicle to activate compressor clutch
8. If rear AC system is **ON** the front AC may be **ON or OFF.** The aftermarket CAN control module will request the AC clutch on if the rear AC is on and the front AC is off

## AC AND HEATER SYSTEM HOSE ROUTING RECOMMENDATIONS

1. R134a charged systems must use barrier type AC hose. Barbed fittings and external clamping may not be compatible with this type of hose. Swaged, permanent fittings on this type of hose are recommended
2. It is recommended for the auxiliary system seals and joints that a dual slim line (DSL) seal be used with HNBR O-rings per Ford specification WSH-M2D463-A
3. Ensure adequate clearance (25mm static) in dynamic engine roll zones (i.e. Transmission linkage, steering column shift linkage)
4. Do not route directly over or near the exhaust system
5. Do not route in wheelhouse area
6. When routing in a stone kick up area ensure all lines and hoses are protected with a protective shield or barrier
7. Do not route AC lines by sharp edges or any moving components. There must be a protective shield if clearance to an AC line is less than 25mm (static)
8. To prevent liquid accumulation, a "candy-cane" style connection is required on the Final Stage Manufacturers' suction line. This connection should be attached immediately out of the OEM's suction line. Recommended bend radius should be 20 – 25mm. See Figure 2
9. **Do not** attach any components to the oil and dipstick tubes
10. Secure all hoses with rubber coated metal retention clips. Plastic ties may be used to bundle hoses but should not be used to secure hoses to the vehicle
11. Route hoses outside frame whenever possible
12. Avoid routing or mounting components in the grille opening and obstructing airflow to the AC condenser
13. Use only Nomex or modified para-arimid reinforced EPDM heater hose (Ford specification WSE-M96D34-A2 / A4). Use only worm gear hose clamps on heater hoses. Use only OEM equivalent or metallic "T" or "Y" hose fittings
14. Minimize air pockets in the heater system by adding an air bleed off device at the system's high point or by using a vacuum or pressure fill process
15. Ensure that the inlet to the aux heater is at the bottom, and the outlet is at the top to help push the air out of the core, and that there are no severe U-bends in the circuit to impede de-aeration
16. No hose joints should be located inside the vehicle

AIR CONDITIONING COMPRESSOR

Installers of climate control systems should adhere to the following compressor criterion:

1. The addition of a compressor to a serpentine belt drive system requires the maintenance of the belt tension and wraps requirements of each component of the belt drive system. Correct belt length is critical to the performance of the self-tensioning device and belt wrap.
2. **DO NOT** use any style refrigerant **SHUT-OFF VALVE** for an auxiliary air conditioning system as they may allow the auxiliary refrigerant lines to trap compressor lubricant oil

## F-E1100 ELECTRICAL

1. F-E1101 Any additions or alterations made to the OEM electrical system should comply with the recommendations included here and to the guidelines shown in Ford's **Truck Body Builder's Layout Book** (refer to "Electrical Wiring Section" in the Light Truck Appendix).
2. F-E1102 The completed vehicle total electrical load must not exceed the maximum output of the alternator at normal (200°F) operating temperatures.
3. F-E1103 Modifications to the vehicle charging systems must be done in such a manner as to not cause electrical overload of the OEM wiring, overcharging of chassis batteries, etc. The Ford Truck Body Builders Layout Book or Ford Body Builders Advisory Service should be consulted prior to incorporating any charging system modification.
4. F-E1104 Precautions must be taken to minimize the potential for dead batteries and possible damage to vehicle circuitry. The battery's negative (ground) cable should be disconnected and positioned so as not to recontact the negative post or the battery should be connected to a battery charger at the various work stations to ensure the battery's state-of-charge is not diminished throughout the build process

## F-Series Conversion

Originator: MVE 6 Date Issued: April 2, 2002
QVM Guide (F-Series Unique) Date Revised: 06/23/04

1. F-E1105 Ford makes the following recommendations for wire routings:
   - All wiring should be routed neatly to avoid any visual issues.
   - All wiring should be secured a minimum of every 6"-12" to avoid any functional issues.
   - Wiring should not be routed over the exhaust system or through wheel well areas where they may be damaged by tire or road debris.
   - All wiring should be protected from fastener damage during the build process and from abrasion by any unfriendly surface in dynamic conditions.
   - Wiring which is located in the passenger compartment should be routed away from high temperature areas (e.g., floor pan over catalytic converter).
2. F-E1106 to ensure wires are protected from unfriendly surfaces, all added wiring must be encased in a protective jacket.
3. F-E1107 All wire splices should be twisted, then soldered and sealed, or crimped and sealed using the proper size crimp connector to match the wires being joined. All electrical connectors, fuses, and circuit breakers which are exposed to hostile environments (under hood or underbody) should be:
4. F-E1108
   - Properly positioned to facilitate servicing.
   - Properly protected (covered/sealed) to minimize corrosion.
5. F-E1109 **IMPORTANT:** For further information on equipment installation, refer to "Truck Body and Special Equipment Installation Precautions" in Ford's Truck Body Builders Layout Book

https://www.fleet.ford.com/truckbbas/non-html/Q130.pdf

https://www.fleet.ford.com/truckbbas/non-html/2010/10_Electrical.pdf

**Figure 1: 2017 Super Duty A/C System**

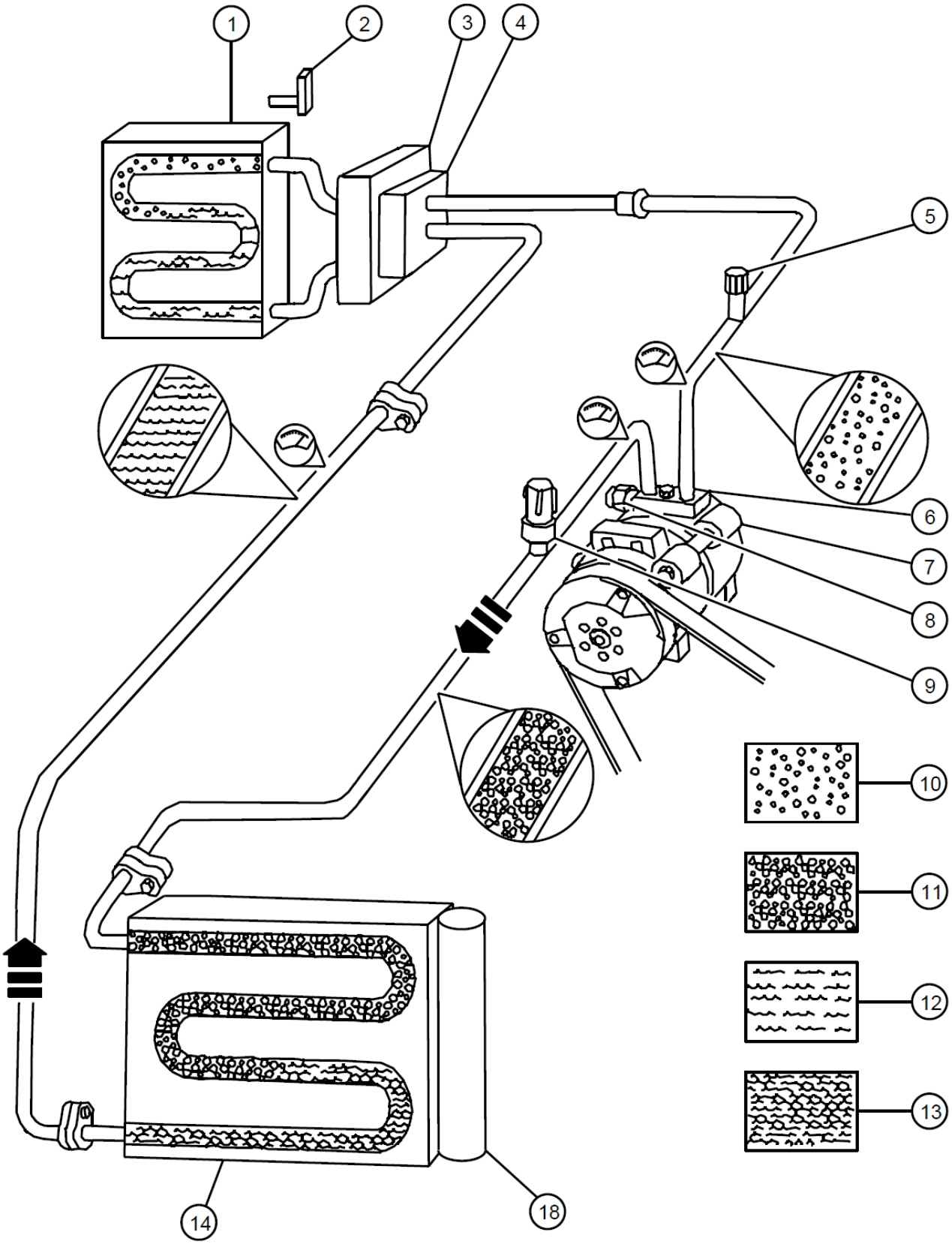

**Figure 1 (continued)**

| Item | Description |
|---|---|
| 1 | A/C Evaporator Core |
| 2 | A/C Evaporator Core Temperature Sensor |
| 3 | Thermostatic Expansion Valve (TXV) |
| 4 | Manifold and Tube Assembly - TXV |
| 5 | A/C Charge Valve Port (Low Side) |
| 6 | Manifold and Tube Assembly – A/C Compressor |
| 7 | A/C Compressor |
| 8 | A/C Pressure Relief Valve |
| 9 | A/C Pressure Transducer |
| 10 | Low Pressure Vapor |
| 11 | High Pressure Vapor |
| 12 | Low Pressure Liquid |
| 13 | High Pressure Liquid |
| 14 | A/C Condenser Core |
| 18 | Receiver Dryer |

**Figure 2:**

Candy Cane Connection